NEHRP Implementation Assessment Notes

DRAFT for Discussion Only

November 2016

2016 Interim ACEHR Report: "As discussed in the September 30, 2015 ACEHR report, much evidence suggests there is a sizeable gap in implementing earthquake hazard reduction measures across the nation. Future directions for NEHRP should be based on an assessment of the nation's risk reduction progress to date and the remaining gaps. A detailed national and regional snapshot of the earthquake resilience of the national and relevant states, cities, and other entities is essential for establishing future priorities. This assessment could be a critical component of a long overdue reauthorization of the NEHRP."

2015 ACEHR Report: "ACEHR believes a fundamental assessment of the nation's earthquake risk reduction progress to date is essential for guiding future direction and funding levels for improving national earthquake resilience. This assessment should address the extent to which the federal government, states, localities, tribes, and the private sector are taking steps to address the seismic vulnerability of buildings, critical infrastructure and lifeline systems. The assessment should be performed either prior to or as part of a new NEHRP authorization."

Background:

- Shortfalls in implementation have been highlighted as missing links for improving earthquake resilience. Attention to these was an important component of the 2004 NEHRP Act Amendments.
- Key unanswered questions:
    - How much progress has been made in putting seismic risk-reduction practices in place?
    - What gaps remain?

Goals for an Implementation Assessment:

- National in scope
- Consideration of multi-sector roles – governmental, private, and nonprofit sectors
- Focus on risk reduction for the built environment including lifelines
- Multiple risk-reduction practices:
    - Building code adoption AND enforcement (seismic provisions),
    - Efforts to identify and address risks to existing buildings (URM, soft story, tilt up, non-ductile concrete frame),
    - Efforts to identify and address risks to lifelines,
    - Use of planning practices to lessen exposure to seismic hazards including tsunami risks
    - Others practices to include?
- Any study would probably NOT include the following due to funding and timing constraints:
    - A national vulnerability assessment,
    - Resilience (broadly defined) capability assessment,
    - Emergency preparedness assessment (household, business, and individual),

- Assessment of evacuation planning and warning mechanisms (e.g., tsunami, earthquake warning)
- Assessment of recovery planning,
- Assessment of seismic risk awareness by households, businesses, and individuals

Examples or Models for an Implementation Assessment -- no good examples come to mind

- Bunch of conceptual work and limited empirical studies of resilience (not specific to seismic in most cases):
  - Susan Cutter presentation "The Landscape of Resilience Measures" Resilient America Roundtable, September 5, 2014 http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_152239.pdf
  - NRC Report Developing a Framework for Measuring Community Resilience, 2015
  - DHS, Draft Interagency Concept for Community Resilience Indicators and National-Level Measures, June 2016 https://www.fema.gov/media-library/assets/documents/117607
  - Renschler, C.S., Frazier, A.E., Arendt, L.A., Cimellaro, G.P., Reinhorn, A.M. and Bruneau, M. (2010). A Framework for Defining and Measuring Resilience at the Community Scale: The PEOPLES Resilience Framework, U.S. Department of Commerce, National Institute of Standards and Technology, Office of Applied Economics Engineering Laboratory, Gaithersburg, Maryland 20899-8603, Report NIST GCR 10-930.
  - Argonne Labs for DHS Constructing a Resilience Index for the Enhanced Critical Infrastructure Protection Program, August 2010 http://www.ipd.anl.gov/anlpubs/2010/09/67823.pdf
  - ARUP City Resilience Index – funded by Rockefeller Foundation as part of their Resilience initiative .. https://assets.rockefellerfoundation.org/app/uploads/20160201132303/CRI-Revised-Booklet1.pdf
  - World Bank, *Building Regulation for Resilience: anaging Risks for Safer Cities*, 2015. https://www.gfdrr.org/sites/default/files/publication/BRR%20report.pdf
- Examples of approaches dealing with other risks:
  - ASCE Infrastructure Report Card -- very broad focus on vulnerability http://www.infrastructurereportcard.org/
  - Insurance Institute for Business and Home Safety – state-by-state assessment of building code systems for the 18 states most vulnerable to catastrophic hurricanes along the Atlantic Coast and Gulf of Mexico. http://disastersafety.org/ibhs-public-policy/rating-the-states/
  - Insurance Services Office, Building Code Effectiveness Grading – state and local ratings https://www.isomitigation.com/downloads/ISO-BCEGS-State-Report_web.pdf

A VERY MODEST APPROACH TO AN IMPLEMENTATION ASSESSMENT

- Scope and Approach:
  - Based entirely on existing reports/articles and secondary data.
  - Main effort would be assembling all that can be found regarding implementation of seismic risk-reduction practices
  - Review of reports and academic literature regarding building code adoption and enforcement (as relates to seismic), seismic provisions of state and local regulations addressing existing built environment, planning practices to reduce exposure, and lifeline practices and advances. Will take digging to find things and much will be very dated!
  - Collection of secondary data from governmental and related entities:
    - FEMA building code adoption data (does not address enforcement)
    - National Institute of Building Sciences – National Council of Governments on Building Codes and Standards
    - State and tribal hazard mitigation plans and post-disaster assessments that address seismic risks
    - Other? State-specific seismic commission studies, state regional earthquake consortia reports/commentary
  - Collection of secondary data
    - Insurance Services Office, Building Code Effectiveness information
    - Federal agencies (DOT re bridges) and lifeline-related entities – need help in identifying what these might be.
- What this provides:
  - At best, partial answers to the basic questions about progress and gaps
  - A cataloging of existing literature and studies.
- What is missing:
  - Lots! Not a real assessment by any means.
- Effort, Timing, and Potential Cost:
  - Could be done is six months with dedicated effort by a small team of researchers and assistants.
  - Ballpark $100k to $200k depending on travel and personnel costs.

A MODERATE APPROACH TO AN IMPLEMENTATION ASSESSMENT

- Scope and Approach:
  - Incorporate key elements of the modest approach as background – studies, secondary data.
  - Focus on state-level data collection and analysis for the 42 states with seismic hazards – perhaps leading to a state report card on seismic risk-reduction.
  - Efforts to characterize the following among high, moderate, and lower-seismic hazard states (recognizing state boundaries are potentially problematic in this regard):
    - Development of an assessment index of state seismic building code provisions and enforcement, modeled after the IBHS hurricane state building code assessment or ISO Building Code Effectiveness Grading.
    - Development of an assessment index of related state seismic hazard risk reduction efforts as they relate to existing building hazards (URM etc), planning practices for reducing exposure, and other state-level practices (e.g., critical facility provisions).
    - Need to think through what a state-level assessment of seismic related efforts for lifelines would look like, or even if it is possible – tricky set of issues and data collection
- What this provides:
  - Potential "report card" at state level of seismic related risk-reduction efforts, keeping in mind differences in hazards and built environments across states
  - Methodologies for future tracking of progress in seismic risk-reduction
- What is missing or is problematic about this:
  - Blurs variation within states regarding such efforts
  - Assumes states are the key actors in initiating and promoting seismic risk reduction
  - Need to think about including tribal areas (e.g., hazard mitigation plan info)
- Effort, Timing, and Potential Cost:
  - Would probably take at least a year or more.
  - Ballpark $300k to $400k depending on travel and personnel costs.

AN IDEAL APPROACH TO AN IMPLEMENTATION ASSESSMENT

- Scope and Approach:
  - Incorporate key elements of the modest approach as background – studies, secondary data.
  - Focus on state and local-level data collection and analysis among the 42 states with seismic hazards – allowing for state report cards, along with analysis of variation within states, and among cities of different size
  - Would also entail a more extensive study of efforts regarding lifelines (selected aspects) that relate to efforts by public and private operators/managers of lifelines.
  - State and local level data collection regarding building code provisions and enforcement, and related seismic hazard risk reduction efforts:
    - Study to be based upon state data for the 42 states and a sample of local entities within those 42 states to depict variation among local jurisdictions (cities and counties – open question if separately want to include school districts, which may be separate).
    - Development of an assessment index of state and local seismic building code provisions and enforcement, modeled after the IBHS hurricane state building code assessment or ISO Building Code Effectiveness Grading.
    - Development of an assessment index of related state and local seismic hazard risk reduction efforts as they relate to existing building hazards (URM etc), planning practices for reducing exposure, and other state and local-level practices (e.g., critical facility provisions).
  - Study of efforts regarding lifelines would be largely separate, and as such could be undertaken by a different entity or set of individuals.
    - Data collection for sample of public and private lifeline operators/managers within different regions/jurisdictions regarding lifeline location, and seismic-risk reduction practices/efforts regarding aspects of the lifeline facilities.
    - Lots of issues to think through!
- What this provides:
  - National picture at state and local levels, including national picture of lifeline seismic risk reduction practices
  - Ability to compare findings
  - Development of methodologies for further tracking of seismic risk-reduction efforts
- What is missing or is problematic about this:
  - Would need to think about how to include tribal areas and if they should be called out in some way
  - Tricky issues regarding sampling of local jurisdictions (basis for sampling, number of entities, etc) and data collection. Example of this being done on a more limited scale was a NSF study by P. May and others involving questionnaires administered among 258 local governments over 2,500 population within 11 western states for data collected in 1995. See P. May and T. Jens Feeley, 2000. "Regulatory Backwaters: Earthquake Risk Reduction in the Western United States," *State and Local Government Review* 32 (1): 20-33.

  - Also, tricky issues for identifying sample frames and sample for lifeline operators/managers, much less identifying respondents.
  - Does not get at the range of items noted earlier regarding broader notions of seismic resilience, preparedness planning, recovery planning, risk awareness and so on.

- Effort, Timing, and Potential Cost:
  - Would probably take at least a couple of years or more.
  - Akin to a couple of major NSF research projects – total of some $800k to $1m